Understanding Evolutionary Acquisition Strategies

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275-2443

Overview

- The what and why of EA
- EA strategy versus Incremental and Spiral Development processes
- What does it mean for T&E?

What do we mean by "Evolutionary Acquisition Strategies"

ev·o·lu·tion·ary adv: 1. process in which something changes (develops) into a different and usually better or more complex form

ac·quis·i·tion *n.* 1. The act of gaining possessions ~~delivering warfighting capability~~

strat·e·gy *n.* 4. A plan or method for achieving a specific goal.

Plans to develop and deliver incremental warfighting readiness, integration, & utilization over time

AF CORE PROCESSES

- CAPABILITY PLANNING
- WARFIGHTING READINESS
  - NEW CAPABILITY INTEGRATION
  - EXISTING CAPABILITY EFFECTIVENESS
    - NEW ASSET INTEGRATION
    - ASSET REPLACEMENT
    - EXISTING ASSET ENHANCEMENT
    - NEW MANPOWER INTEGRATION
    - MANPOWER REPLACEMENT
    - EXISTING MANPOWER ENHANCEMENT
- WARFIGHTING INTEGRATION
- CAPABILITY UTILIZATION

THE FOCUS OF OUR WORK

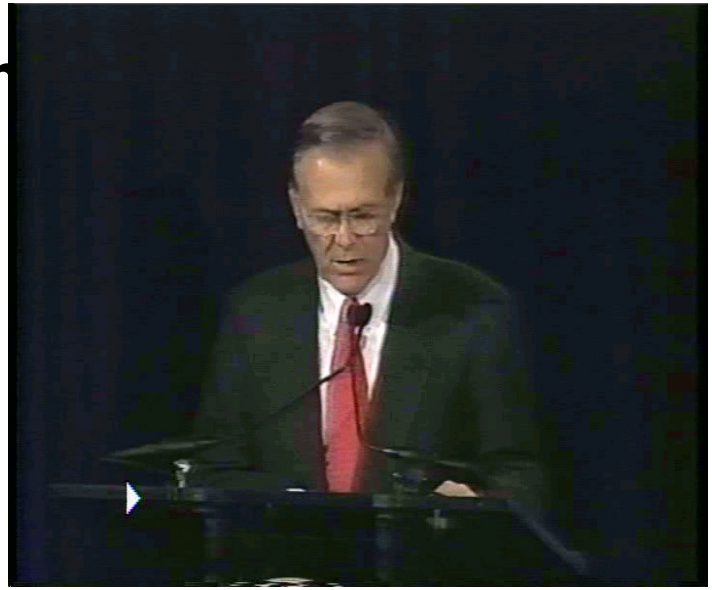
Responsiveness

"Advanced technology shall be integrated into producible systems and deployed in the shortest time practicable. Approved, time-phased capability needs matched with available technology and resources enable evolutionary acquisition strategies. Evolutionary acquisition strategies are the preferred approach to satisfying operational needs. Spiral development is the preferred process for executing such strategies."

Why Evolutionary Acquisition?

Problems

- Long acquisition response times
- Delivered weapon systems' technology at least a generation old



Approaches

Take advantage of private sector expertise

Forge a new compact with warfighter

Long Acquisition Times

Basic problem

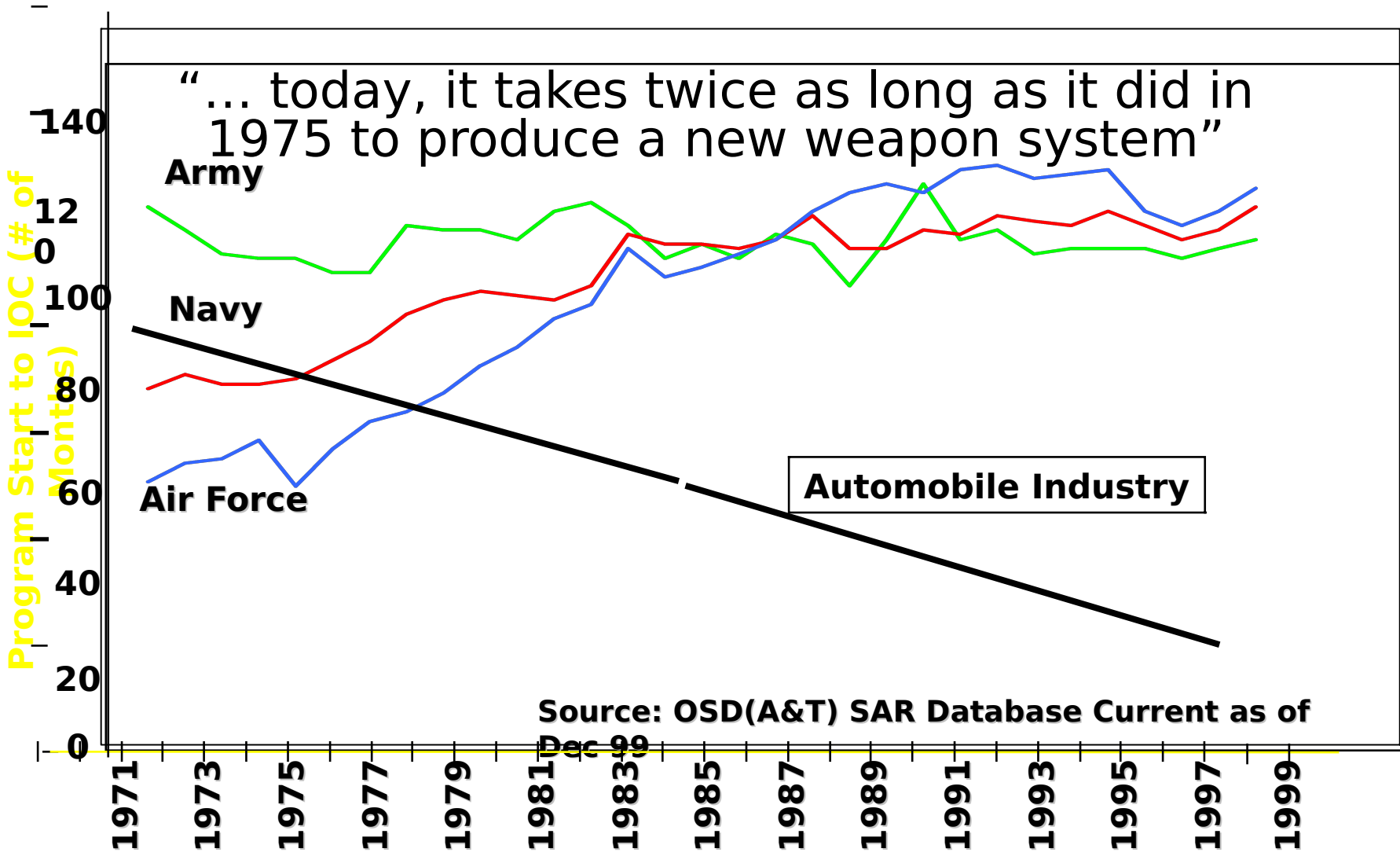
- **Not getting capability to the operators quickly enough**

Other problems when programs are stretched out

- **Keeping up with technology**
- **Leadership changes that open program to increased scrutiny**
- **Cause problems for**

Asst Secretary of the Air Force for Acquisition
3 Dec 2002
Hanscom AFB, MA

Why Evolutionary Acquisition?

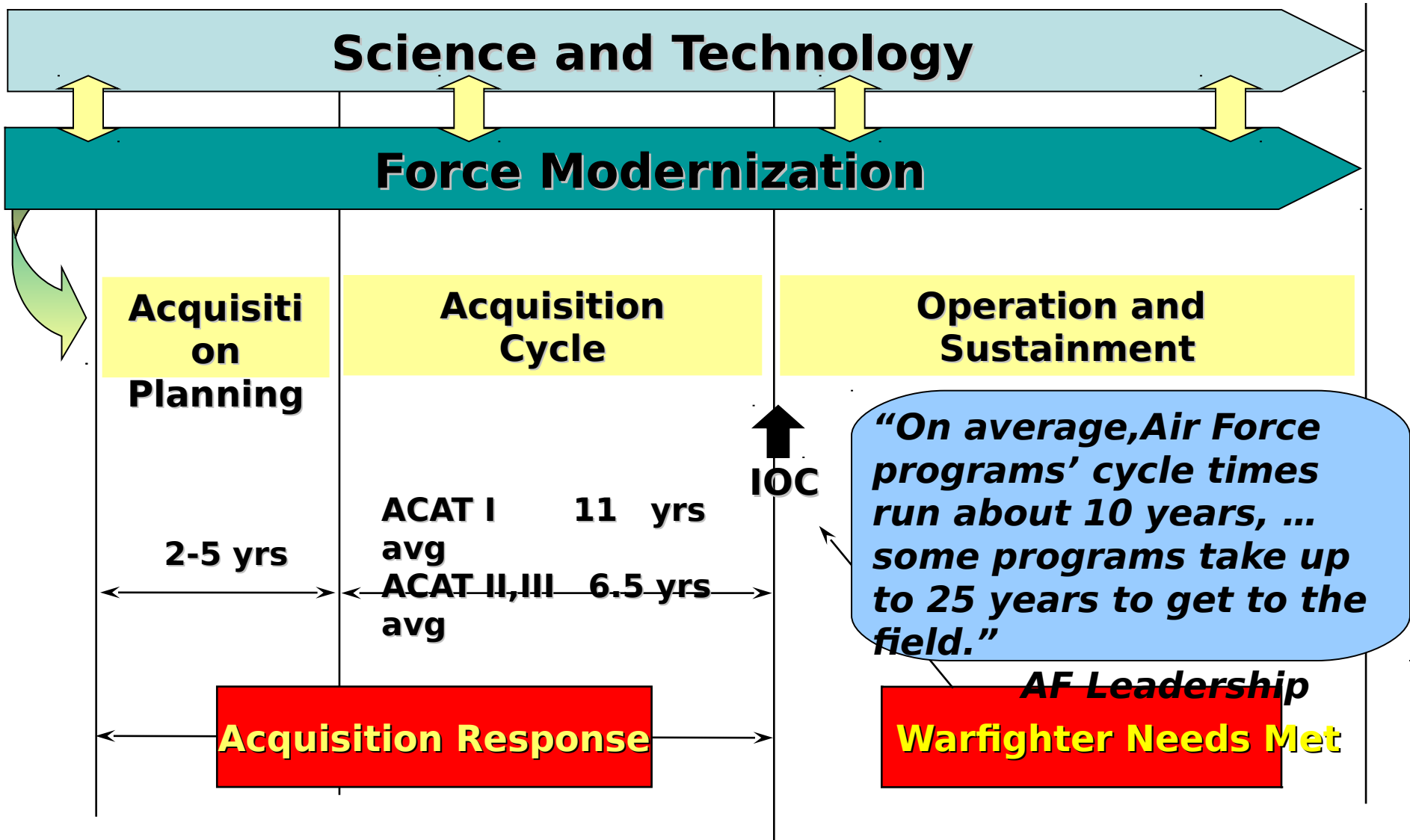


Commercial Success at Shortening Cycle Times

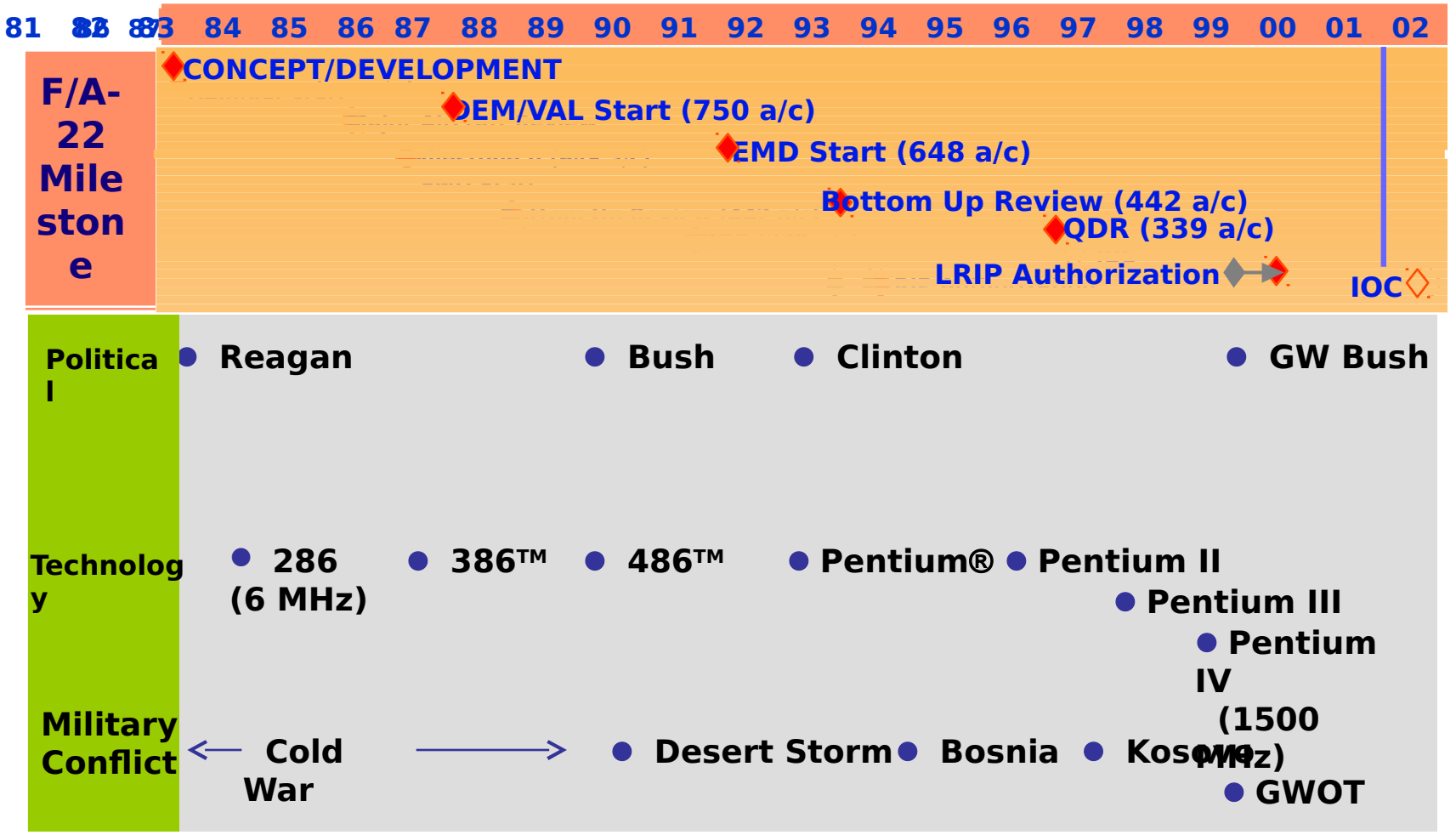
Goal	Old Time	Current (1998-99)
Automobile	84 months	24 months <18 months
Commercial Aircraft	8-10 years	5 years 2.5 years
Commercial Spacecraft	8 years	18 months 12 months
Consumer Electronics	N/A	2 years 6 months

50%-70% Reduction In Product Development Times Are Typical

Acquisition Response Time

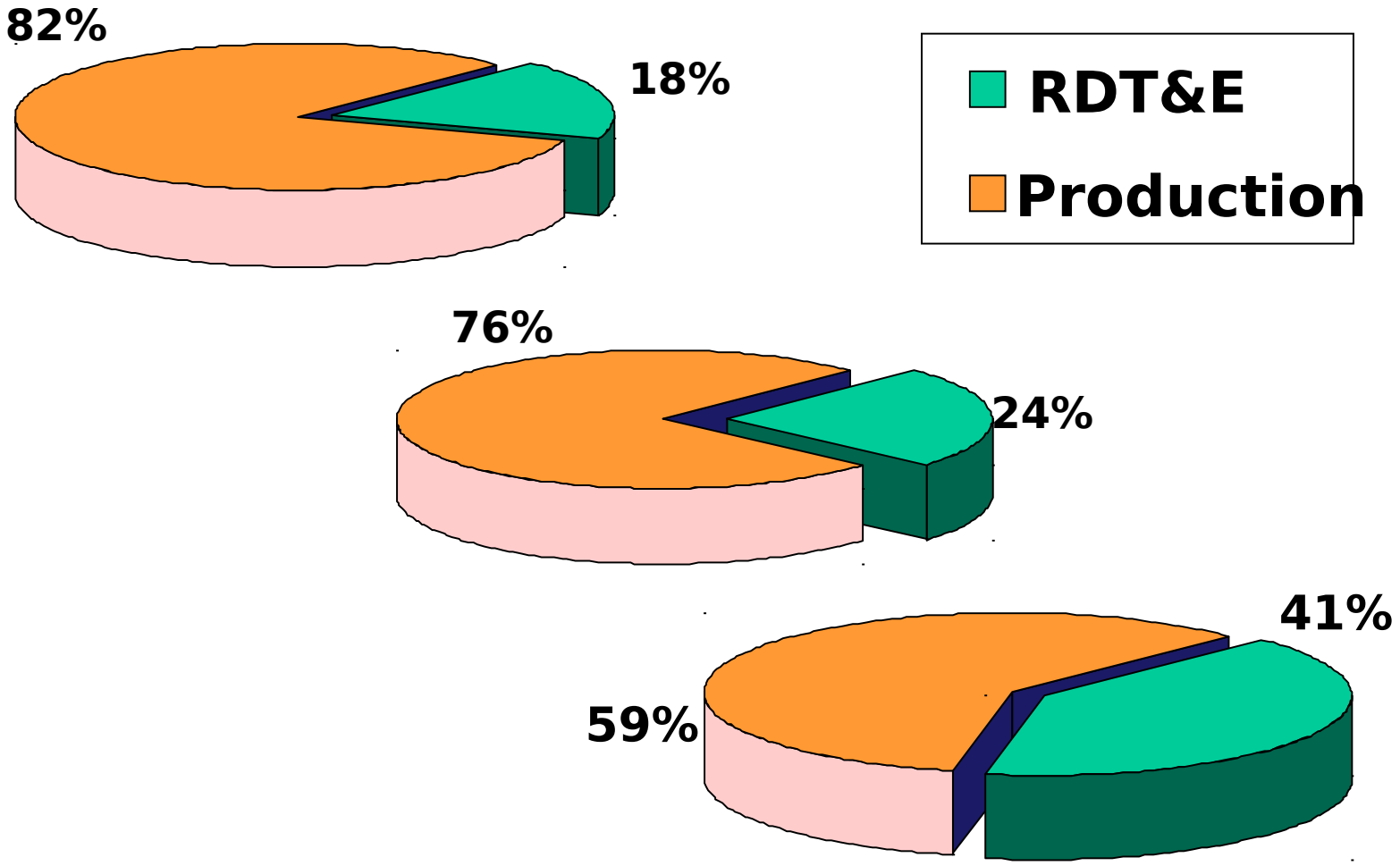

Science and Technology
Force Modernization
Acquisition Planning
Acquisition Cycle
Operation and Sustainment
IOC
2-5 yrs
ACAT I 11 yrs avg
ACAT II,III 6.5 yrs avg
"On average,Air Force programs' cycle times run about 10 years, … some programs take up to 25 years to get to the field."
AF Leadership
Acquisition Response
Warfighter Needs Met

Background: Events During 20-year Life Cycle



Increased Development Cost

Development Cost to Investment Cost By Years in Development



Rand SAR Database - ACAT I Programs - From Program Initiation to First Operational Delivery

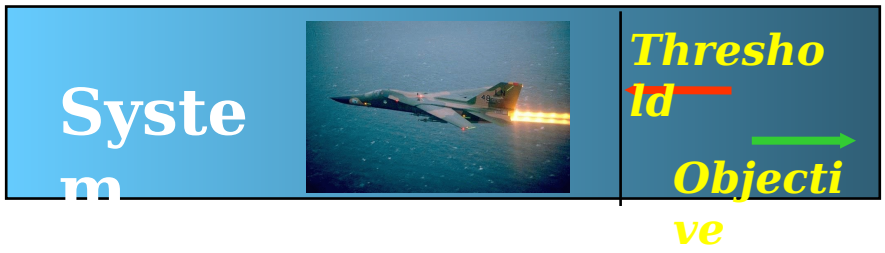
Call for a New Approach

"get new capabilities to the warfighter even faster …

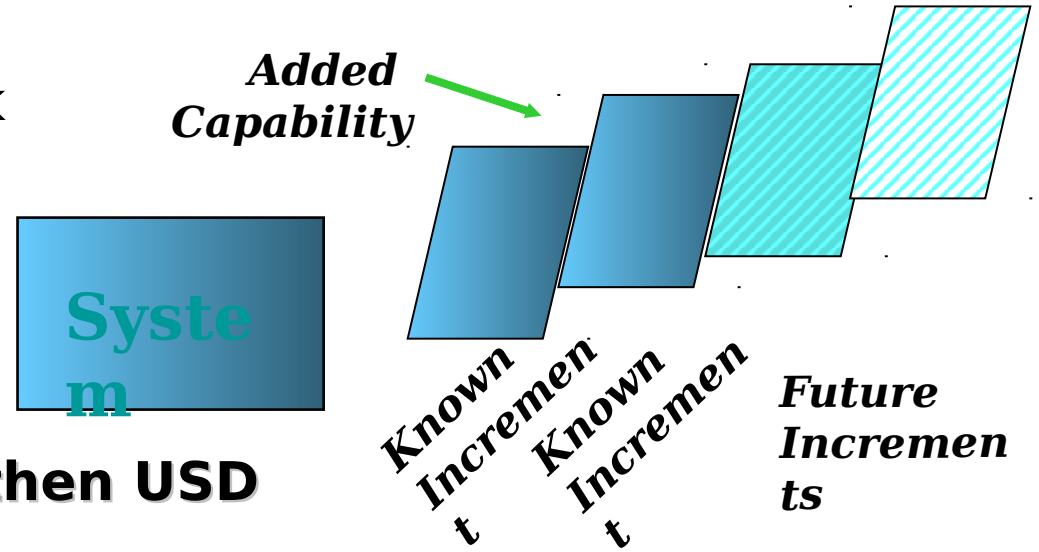
… fielding new systems with some but not all of the their ultimate features …

… and adding new technologies in block upgrades as they become available"

Traditional Acquisition



Evolutionary Acquisit



Mr. Pete Aldridge, then USD AT&L

Evolutionary Acquisition Policy

- Late 1980's through 1993
  - Joint Logistics Commanders' (JLC) publication
  - Primary applications in C^4I community
- Updated in 1995
  - Alternate acquisition strategy in DoDD 5000.1
  - Defense System Management College EA Guide (Updated 1998)
  - Air Force Instruction 63-123 (EA for C2 Systems, April 2000)
- Prescribed in 2001
  - Preferred strategy in Jan 2001 update to DoDI 5000.2
- Mandated/Preferred
  - 19 Jan 2002 USD(AT&L) Memo
  - Oct 2002, NDAA FY2003 Sections 802 & 803
  - 12 May 2003 Defense Acquisition System
    - 5000.1 and 5000.2

New

Additional Guidance
Many Changes in Work

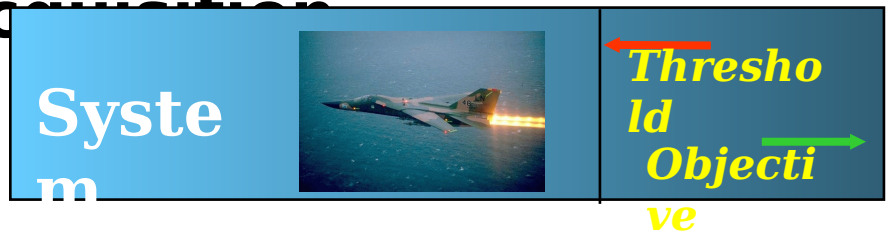
- Air Force Acquisition
  - New – AFPD 63-1 Capability Based Acquisition
  - AFI 63-101 Operation of the Capability Based Acquisition System (Draft 6 Aug 2003)
- Requirements
  - New – Chairman of the Joint Chiefs of Staff Instruction CJCSI3170.01C, 24 Jun 2003
  - New – Air Force Instruction 10-601 (Interim Oct 2003)
  - Capabilities Review and Risk Assessment (CRRA)
- Test
  - Capability Based Test and Evaluation, AFI 99-103, Draft 2003

EA & Capability-Based Acquisition

- EA is consistent with Capability-Based Acquisition
- Capability = ability for the warfighter to deliver the desired effect at the right time (ultimately, as defined by the warfighter)
- Requirement = element in a planned design solution (e.g. system, network of systems) to achieve a capability

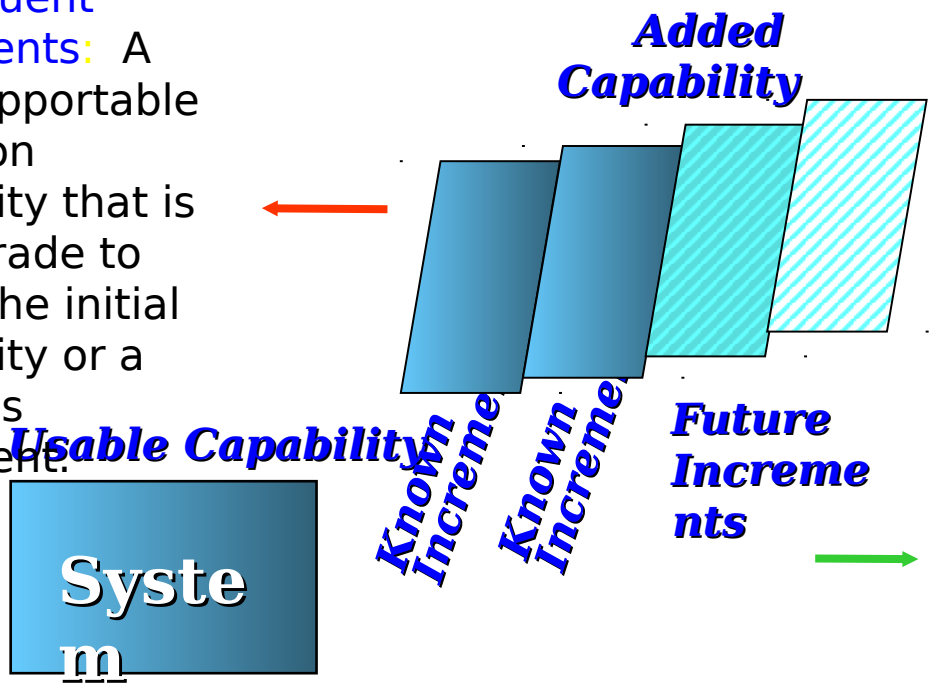
What is Evolutionary Acquisition?

Traditional Single-step Acquisition



Evolutionary Acquisition

Subsequent Increments: A fully supportable follow-on capability that is an upgrade to either the initial capability or a previous increment.



Initial (Core) Increment: A fully supportable system meeting an initial level of user-defined operational capability, not dependent on future increments to be fully operational.

Compare

Traditional Approach

- ORD requirement delivered at end of development
- Arms length relationship with stakeholders
- Many detailed specs & stds
- Independent centers making platform-centric-based decisions
- Focus on acquisition costs
- More compartmentalized DT & OT

EA Approach

- Partial solution fielded early using ICD, CDDs, & CPDs
- Stakeholder teaming required
- Fewer specs & stds/performance-based requirements
- Innovative, flexible acquisition processes
- Enterprise CONOPS
- Leadership employing capability-based decisions
- Greater focus on total ownership costs
- Accelerated delivery schedules
- More emphasis on seamless verification

Evolutionary Acquisition

- Delivers capability in increments, recognizing, up front, the need for future capability improvements.
- Balances needs and available capability with resources to put capability into the hands of the user quickly.
- Depends on consistent and continuous definition of requirements, and the maturation of technologies that lead to disciplined development and production of systems that provide increasing capability towards a materiel concept.

DoDD 5000.2, Paragraph 3.3.1
"Operation of the Defense Acquisition System"
12 May 2003

An Increment is…

a distinct set of **planned** activities supporting the goal of **delivering an operational capability to the user**.

An increment accommodates three activities:

- develop new capabilities supporting the operational requirements and goals of the system
- exploit opportunities to insert new technologies that reduce cost of ownership or accelerate fielding of new capabilities (resulting from tech demos)
- refine current capabilities based on user feedback, testing, or experimentation

AFI 63-123 EA for C2 Systems, 1 Apr 2000

Spiral Development

DoDI 5000.2

Spiral Development is an iterative risk reduction process to develop concepts, baselines and to field capabilities.

- Desired capability [effect] is identified, but the end-state [product] requirements are not known at program initiation.
- Requirements are refined through demonstration and risk management; there is continuous operator feedback
- Each increment provides the operator the best possible capability [desired effect].
- Requirements for future increments depend on feedback from users and technology maturation.

Spiral Development Process

12 April 2002

An iterative process for developing a defined set of capabilities within one increment.

This process provides the opportunity for interaction between the user, tester, and developer. In this process, the requirements are refined through experimentation and risk management, there is continuous feedback, and the user is provided the best possible capability within the increment.

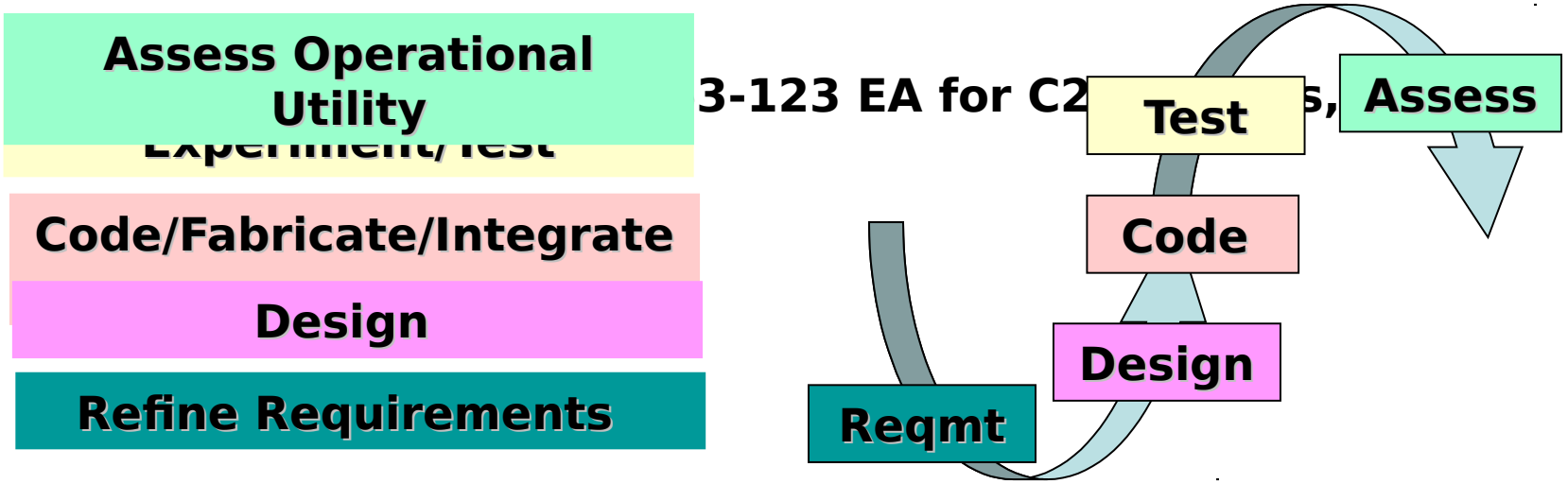
Each increment may include a number of spirals. Spiral development implements evolutionary acquisition.

Mr. Aldridge, then USD AT&L

Memo to Services, April 12,

Single Spiral

A sub-process which may include: establishing performance objectives; designing; coding/fabricating/integrating; experimenting; testing; assessing operational utility; making tradeoffs; and delivering. Ends in a decision affecting the development of a concept or baseline.



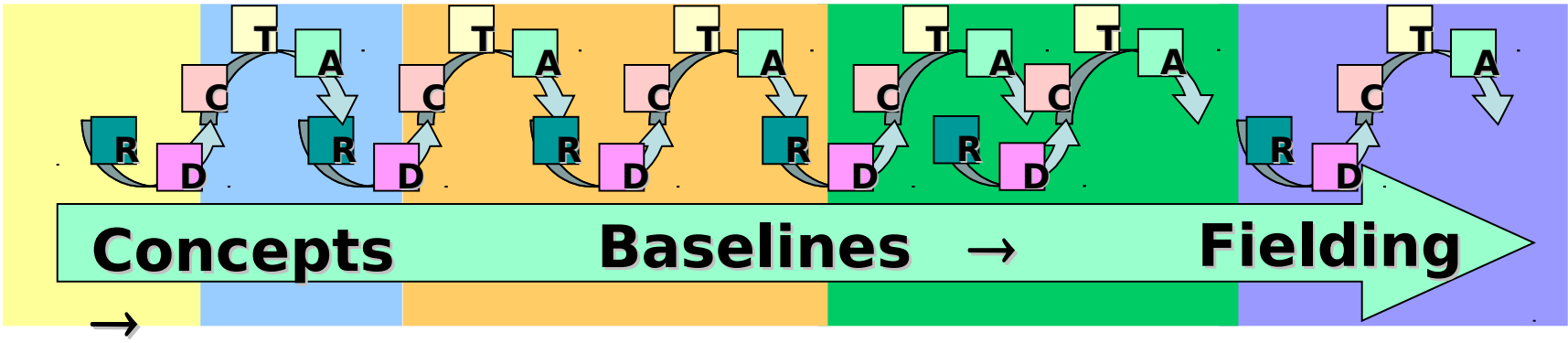
One Iteration = One Learning Spiral

Multiple Spirals to Reduce Risk

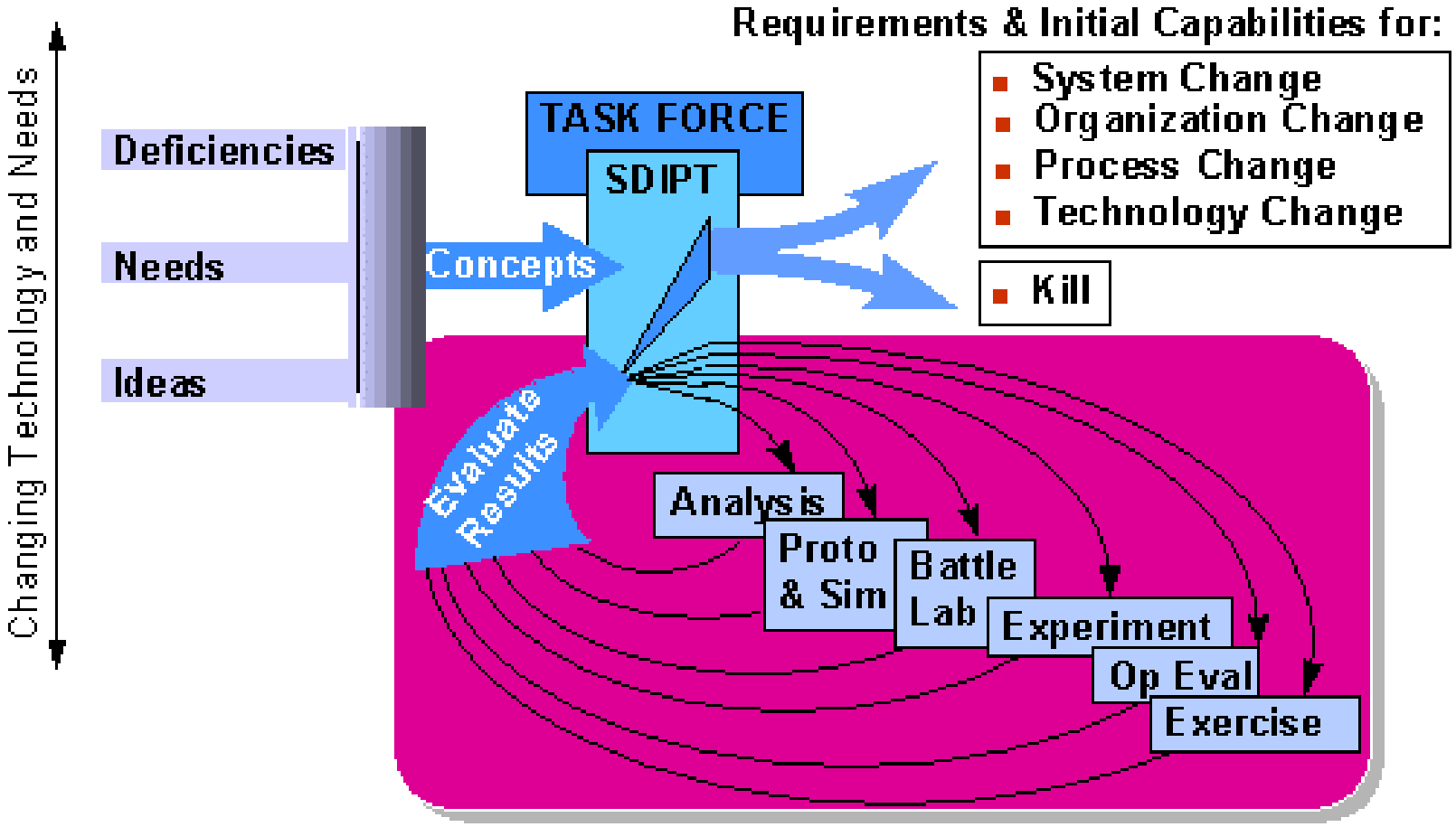
Concept Development - matures new ideas and technologies into well-defined requirements and initial capabilities.

Baseline Development - refines, integrates, and tests concepts into solutions ready for fielding.

Capabilities Fielded - integrated solutions into warfighting capabilities, then operates and supports them throughout their life. AFI 63-123 EA for C2 Systems, 1 Apr 2000

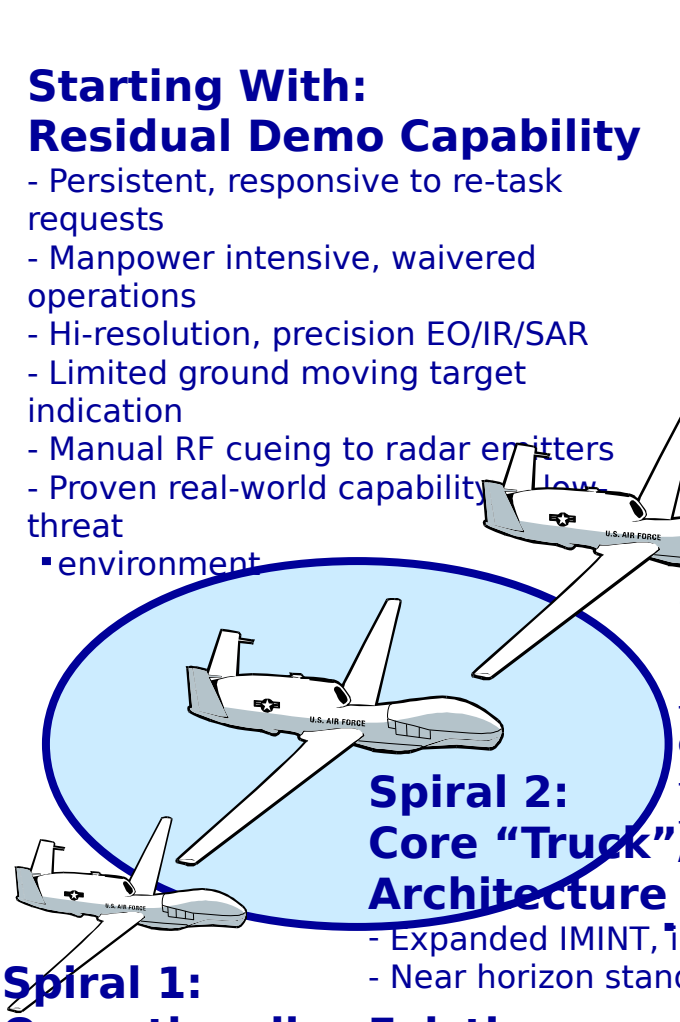


Concept Development



AFI 63-123 EA for C2 Systems, 1 Apr 2000

Global Hawk Spiral Capability



Starting With:
Residual Demo Capability
- Persistent, responsive to re-task requests
- Manpower intensive, waivered operations
- Hi-resolution, precision EO/IR/SAR
- Limited ground moving target indication
- Manual RF cueing to radar emitters
- Proven real-world capability, low threat environment

Spiral 1:
Operationalize Existing System
- World-wide operating capability
- Sustainable support system

Spiral 2:
Core "Truck"/Open Architecture
- Expanded IMINT, initial SIGINT
- Near horizon standoff range

Spiral 3:
Full-spectrum SIGINT
- Signals Intelligence to support mid-scale engagements
- Machine level horizontal integration capable
- Defensive threat awareness

Spiral 4:
Improved Radar
- Improved range and resolution
- Track quality ground moving target identification
- Airborne surveillance capability
- Enhanced airspace operations and survivability

Spiral 5-6:
Full-spectrum operatio
- Full horizontal integration
- Expanded communications
- Extreme environment / NBC ops

Flex Opportunity:
Focused system configurations
- SIGINT to support full-scale engagements
- Foliage penetration, Multi-spectral sensin
- Airborne communications node

Note: Final = ASARS, IR-3, -4, -13-16, etc.

X-45A
Concept Development

Spiral 0: 48 discrete demonstrations

lab, simulation and flight tests

- **Wing attachment**
- **Autonomous Taxi**
- **Concept of Operation**
  - **-- Mission Control Segment**
  - **-- Decision Aiding S/W**
- **Distributed Control**
- **Loss of Communication Response**
- **Four- Dimensional Navigation**

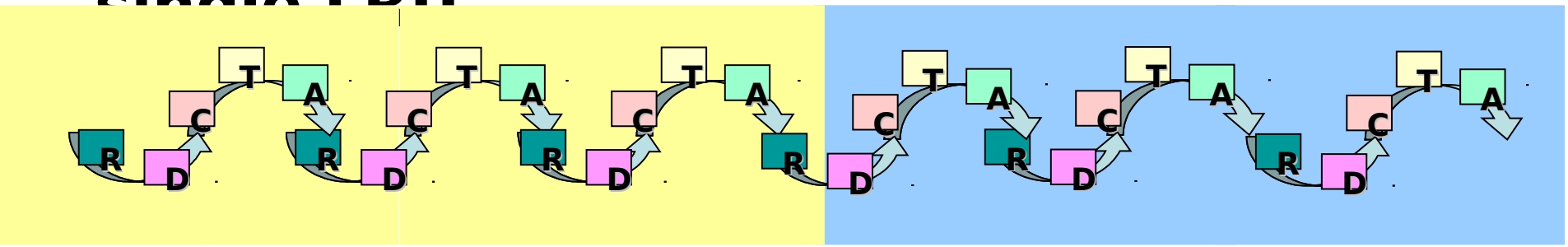
Spiral 1: 40 planned demonstrations

DARPA News Release March 4, 2003

Embedded GPS/INS (EGI) Concept Development

Concept:

Replace INS and add GPS within a single LRU



Flight Test of Concept

Lab testing for vulnerability to jamming

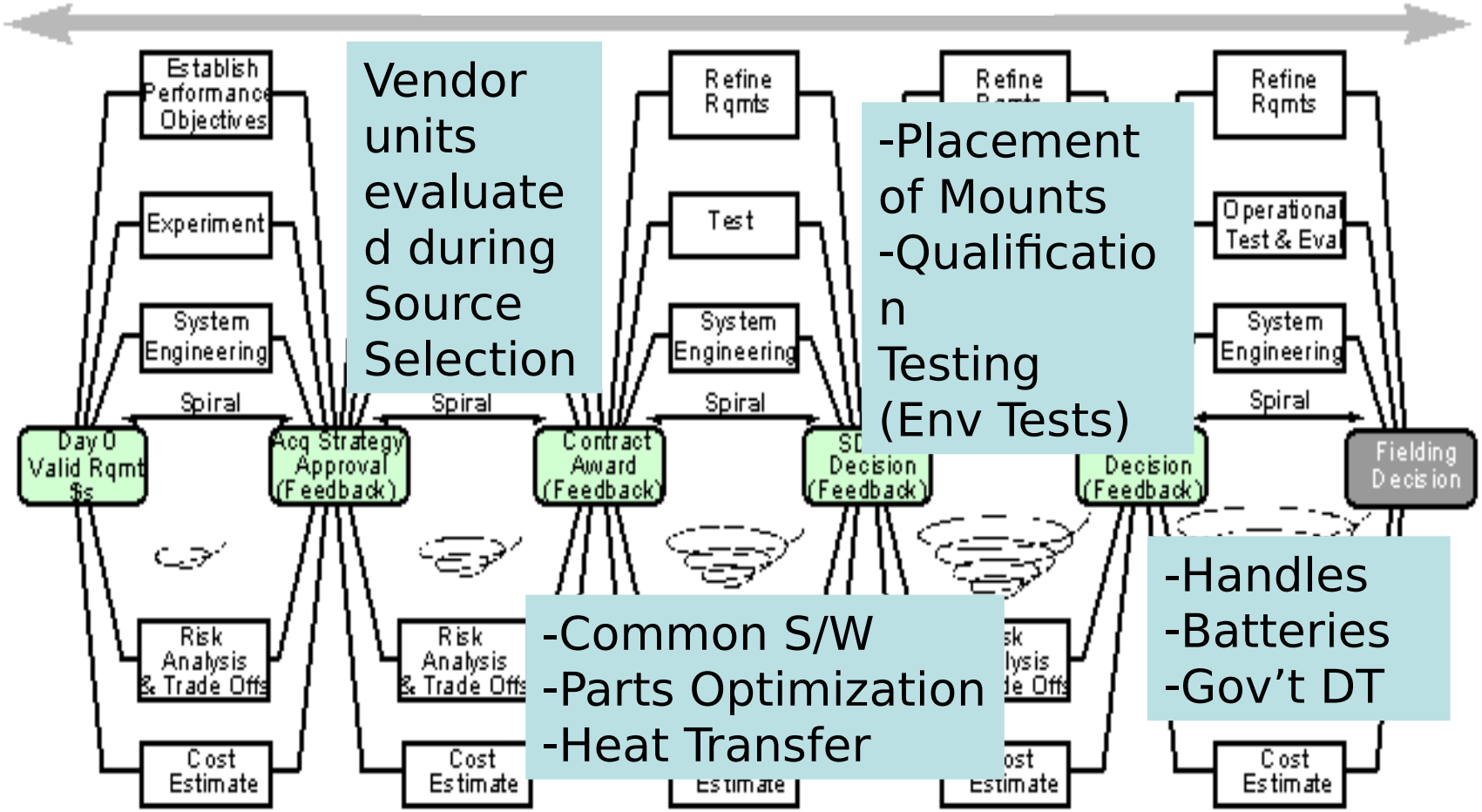
Modeling and Simulation for Targeting

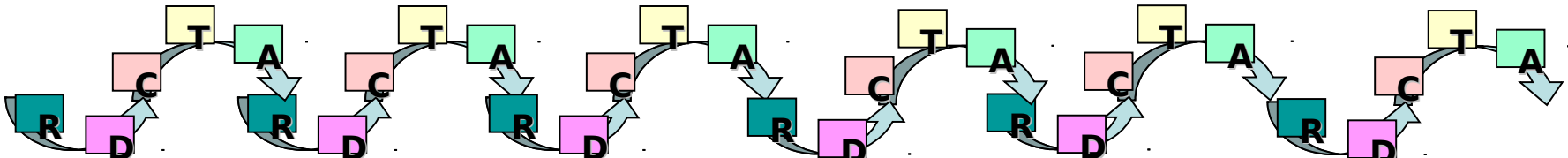
Demonstration flights on a Helo

Baseline Development

- Begins with the requirements and capabilities developed during Concept Development
- Refines, integrates and tests capabilities into a solution ready for fielding
- Part of a formal acquisition program, typically the MSB to MSC activities
- Concludes when user accepts the results of an increment for fielding

Embedded GPS/INS (EGI) Baseline Development

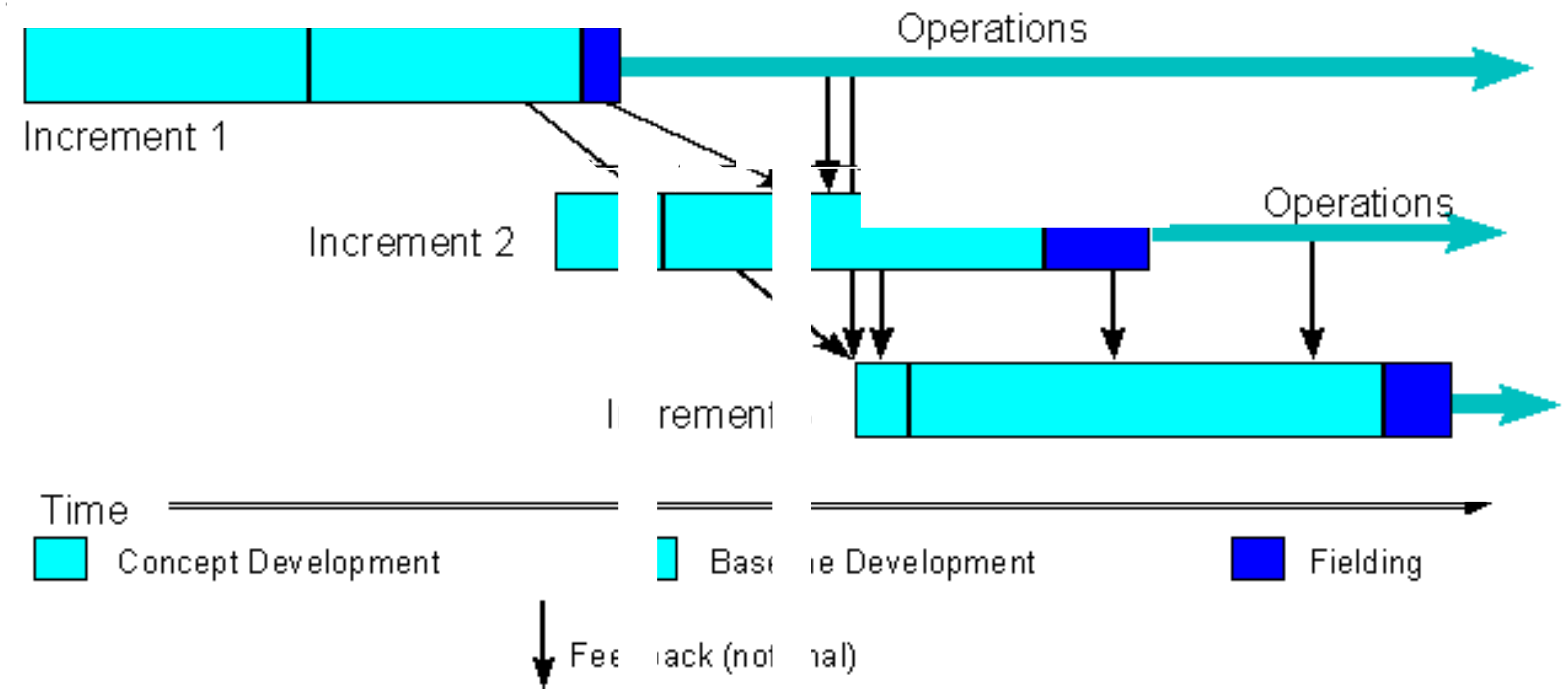




Operations and Support

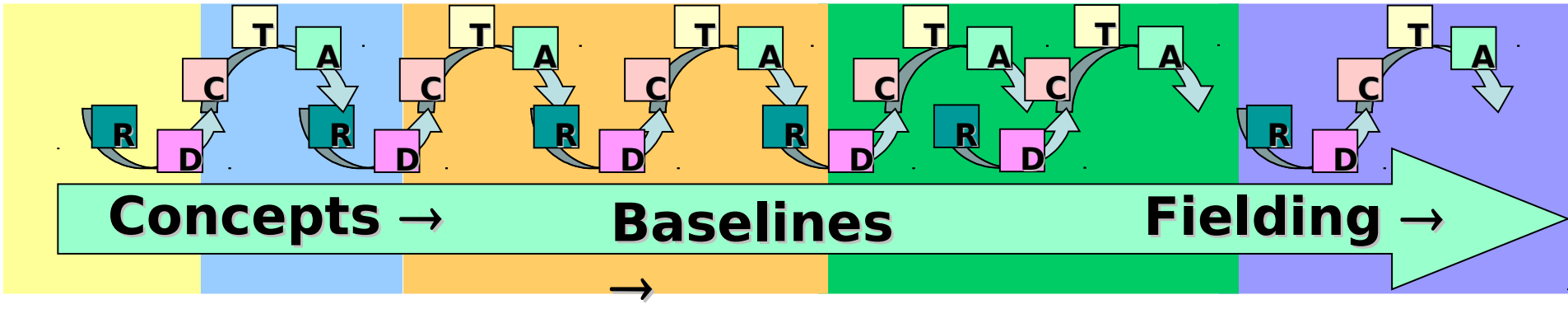
- These activities include fielding … subsystems (systems) from Baseline Development and then operating and supporting it throughout its (the system's) remaining life span
- Part of a formal acquisition program
- Feedback from the system operators is used to improve or change upcoming increments or may alter the envisioned final state of the system

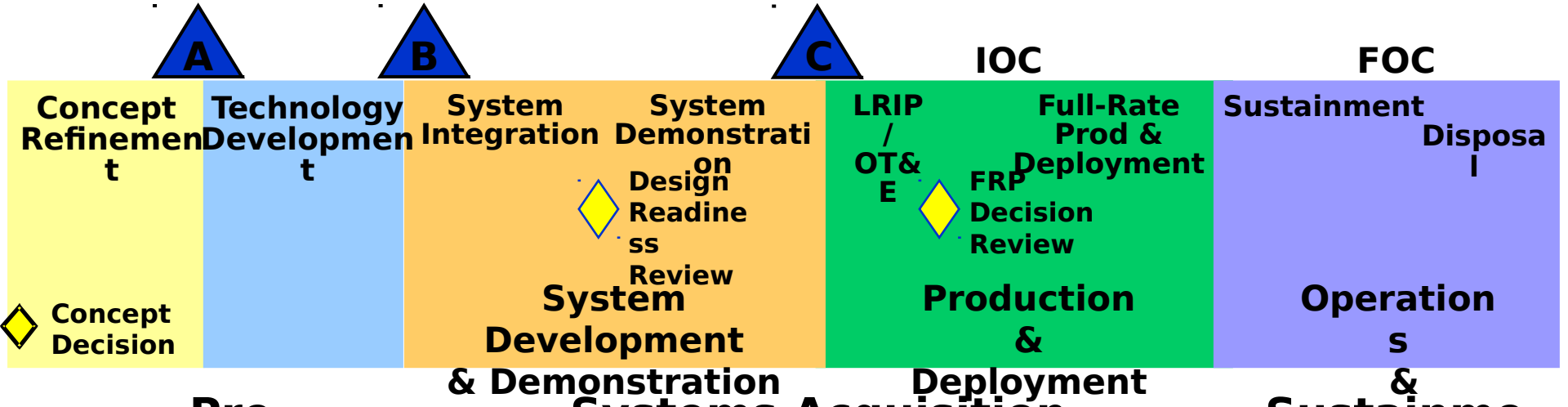
Fielding of Capability



AFI 63-123 EA for C2 Systems, 1 Apr 2000

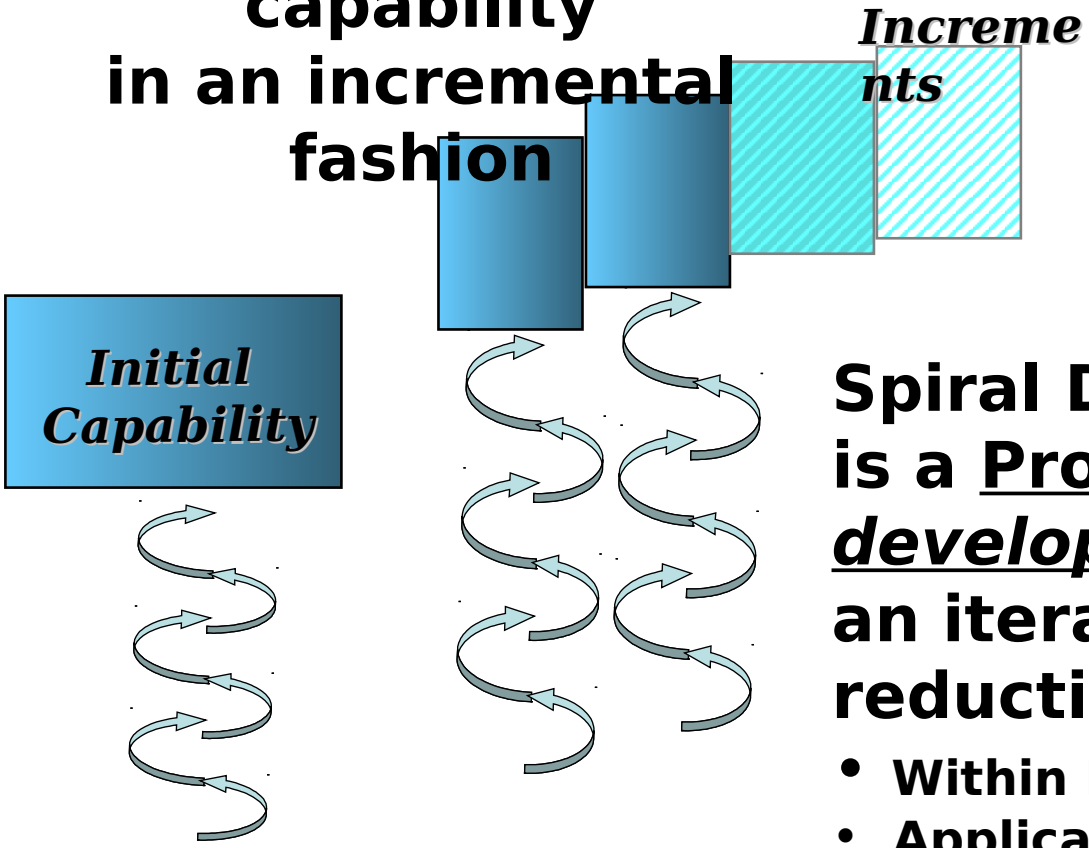
Acquisition Management Framework
12 May 2003





Evolutionary Acquisition with Spiral Development

Evolutionary Acquisition is a <u>Strategy</u> to *<u>deliver</u>* capability in an incremental fashion



Spiral Development is a <u>Process</u> to *<u>develop</u>* capability in an iterative, risk reduction fashion

- **Within Increment (or Block)**
- **Applicable for both Single-**

Focus on Acquisition Planning

"The concept (EA) comes with several implications. It will require a closer approximation between available [mature] technology and mission needs…"

Pete Aldridge, then USD AT&L

InsideDefense.com, October 31, 2001

- Mission Needs: What does the user need and how do they want to operate
  - Architectures (Operational, system, technical)
- Available technology: Assessing what is ready now and what will be ready
  - Technology readiness levels

Compact with the Warfighter

"Technology development is a continuous technology discovery and development process reflecting close collaboration between the S & T community, the user, and the system developer. It is an iterative process designed to assess the viability of technologies while simultaneously refining user requirements."

DoDI 5000.2, para 3.6.1

"Collaboration is the Answer"

Focus on Acquisition Cycle

"…. A good start is to stop focusing only on the 100 percent solution. Doing so consumes huge amounts of money and time, often adding very little value to the finished product."

Pete Aldridge, then USD AT&L

InsideDefense.com, October 31, 2001

"…. There should be requirements for that which we are going at now… Looking at follow-on set(s)… Not wait for the 100 % solution… That isn't smart."

James G. Roche

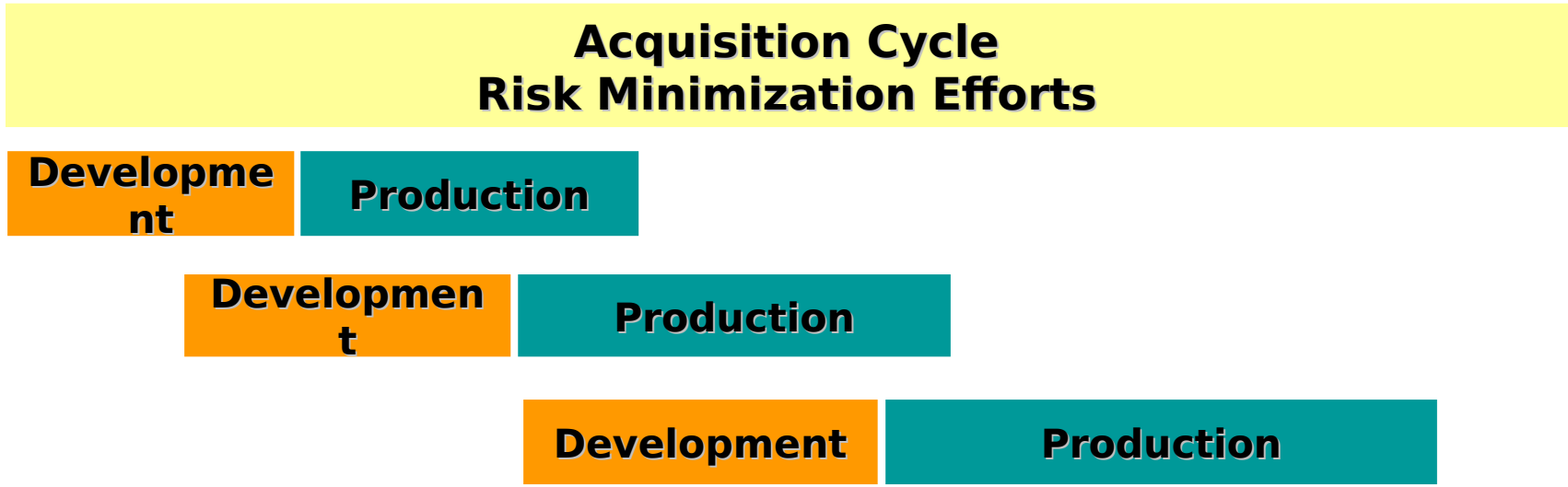
Secretary of the Air Force

21 Oct 2002

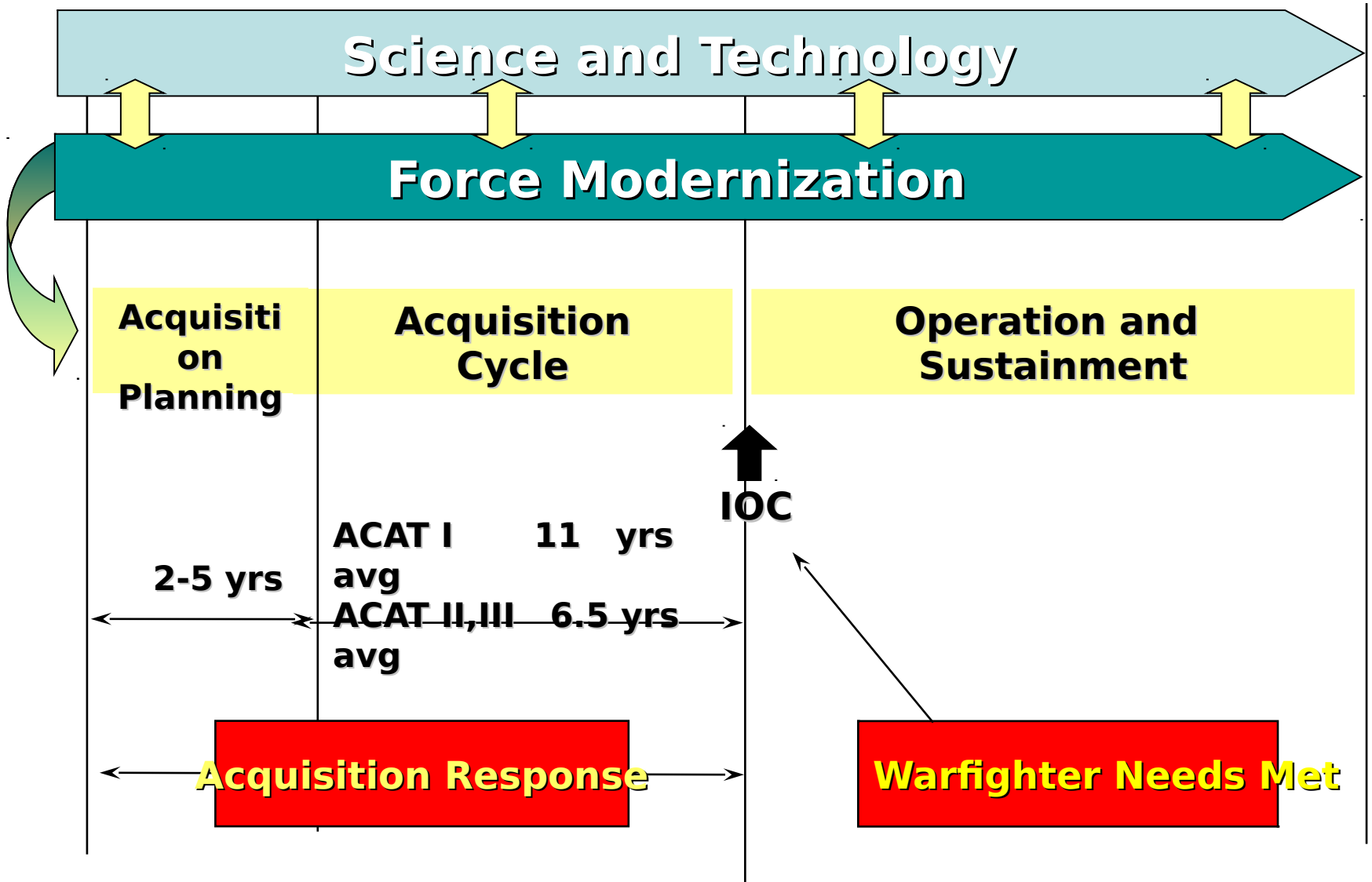
Offer Evolutionary Strategies to the Warfighter

Traditional

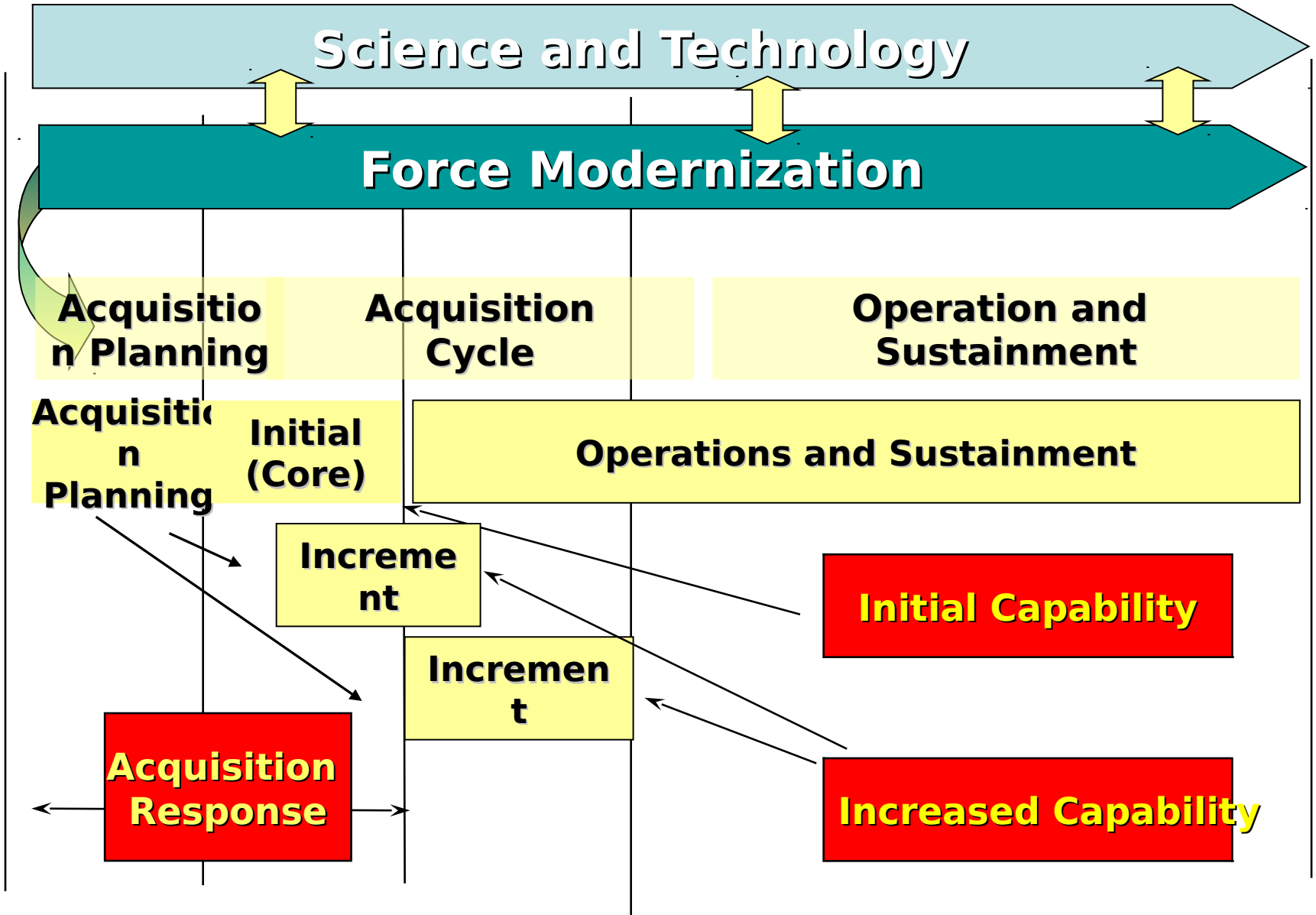
Evolutionary



Acquisition Response Time



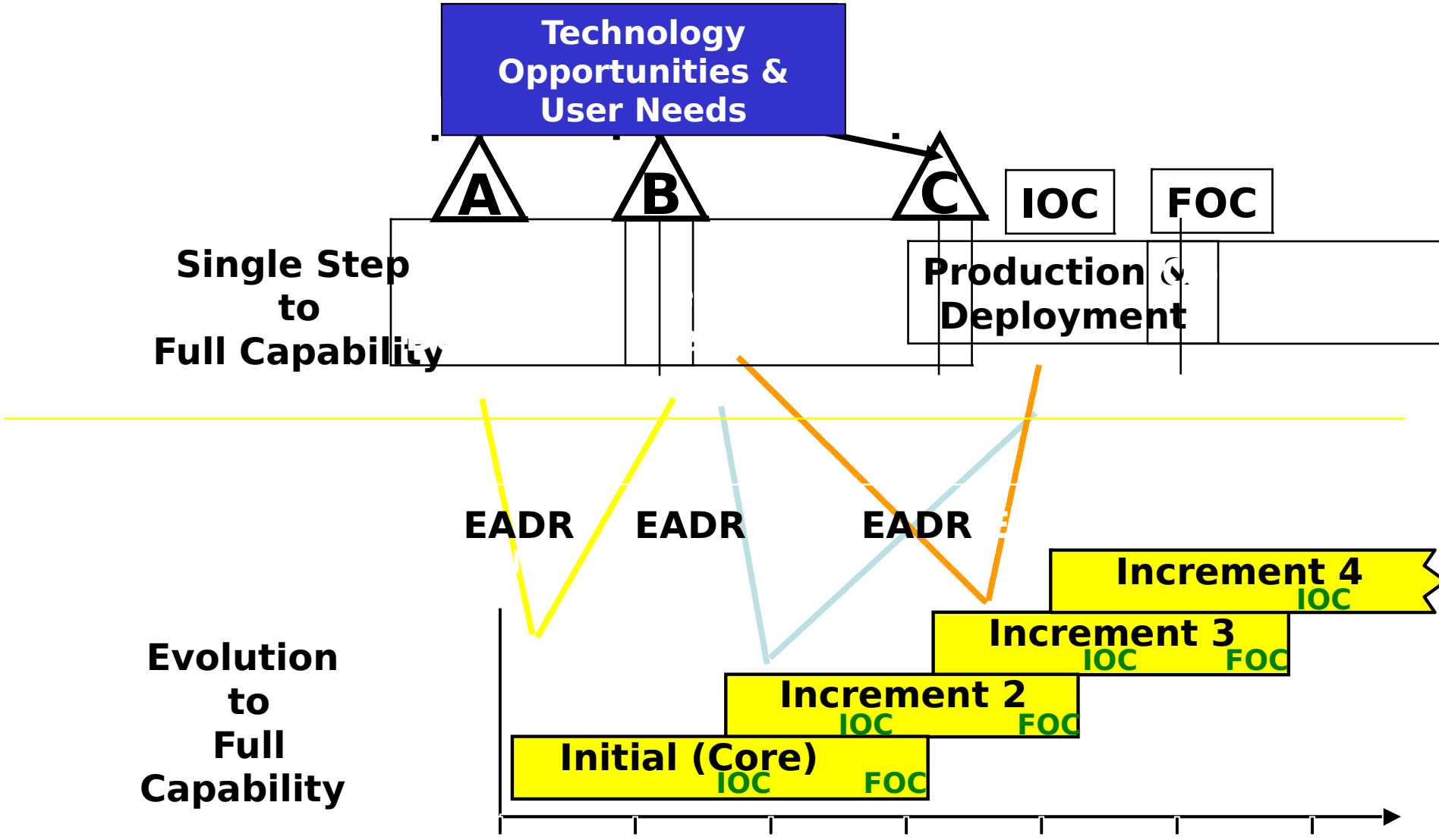
Reducing Acquisition Response Time



Tailored Decision Points

Evolutionary Acquisition Decision Reviews

(Planned use by PEO C2 & CS programs)



Implications for the T&E Community

- T&E will continue to be integral to incremental capability releases
  - Synchronize weapons testing with OFP cycles
  - More emphasis on seamless verification
- High Performance Team involvement

  https://www.afreqs.hq.af.mil/hpt.htm
- Expect more contractor involvement up front
  - Logistics support
  - Diminishing manufacturing sources

EA Concerns

- We’re already doing this!
- EA programs will take longer and cost more!
- You want me to do more, but I’m too busy already!
- It won’t work for big (small) programs!
- Warfighters won’t accept partial solutions!

Summary

- **EA strategies rapidly acquire mature technology and deliver capabilities in increments with a plan for future capability improvements.**
- **There are two approaches to EA**
  - **Spiral Development with unknown end-state requirement**
  - **Incremental Development with known end-state requirement**

Questions???